Calculating In Spreadsheet Cells Without Using Formulas

TECHNICAL FIELD OF THE INVENTION

This invention relates to electronic computing devices and spreadsheet software on those devices, and more particularly to a calculator that has a spread sheet that allows the user to calculate and enter results inside a spreadsheet cell without using or entering a formula

BACKGROUND OF THE INVENTION

Electronic calculators have become a common tool for teaching students mathematics. In particular, the advantages of graphing calculators are being utilized in the classroom. Graphing calculators are characterized by a larger screen, which permits the entry of mathematical expressions in a logical format. They also permit graph displays and table displays. They have sophisticated programming capability. They often permit data transmission to other computing devices, directly or via a data storage medium, as well as data collection via various interface protocols.

Particular calculator models are often designed for particular educational levels. For example, a calculator for middle school students might have less advanced features thanone designed for older students. However, regardless of the level for which a calculator is designed, a continual goal in designing them is to provide a logical and easy to use interface. Another goal of the user interface is to assist the teacher in instructing students in the classroom environment.

SUMMARY OF THE INVENTION

The present invention seeks to improve the user interface for a spreadsheet application. This spreadsheet improvement may be helpful in any type of spreadsheet, but is particularly useful in the classroom environment. The disclosed embodiment is a spreadsheet on a handheld calculator but the invention is applicable and useful for all spreadsheet type applications. The invention introduces an improved user interface to allow the user to calculate and enter results inside a spreadsheet cell without using or entering a formula

A particular problem with prior art computer spreadsheets is calculation in spreadsheet cells is done only with formulas. The prior art formula is always dsplayed in the cell edit line when the cursor is over the cell. The present invention allows the user to easily make calculations within a cell and have the results stored in the cell rather than the formula used to calculate those results.

An embodiment of the present invention is an application program on a graphing calculator or other computer, which allows the user to calculate and enter results inside a spreadsheet cell without using or entering a formula. Similarly, other embodiments include the same user interface functionality in a ROM software application package that is executed on a graphing calculator or other handheld device. The calculator in the present invention may otherwise be a conventional graphing calculator.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 illustrates the front panel of a prior art calculator 10 which incorporates the invention.

FIGURE 2 illustrates the basic screen layout of a spreadsheet on a handheld device according to the present invention.

FIGURES 3a-g illustrate the calculating within a spreadsheet cell according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIGURE **1** illustrates the front panel of a calculator **10**, which incorporates the features of the present invention. Calculator **10** is described herein in terms of particular software and hardware features of the TI-89, a commercially available graphing calculator manufactured by Texas Instruments Incorporated. Apart from the features of the present invention, many of the features of calculator **10** described herein are typical of graphing calculators, while other features are unique to the TI-89 and TI92 Plus "family" of TI calculators. The use of the TI-89 is for purposes of description, and does not limit the invention. The features that are the subject of the present invention could be incorporated into other calculators that provides graphical displays, or they could be incorporated into other computer based teaching tools and handheld computers.

In FIGURE **1**, the screen **11** of calculator **10** has a "graphical display", as that term is used herein. In addition to the ability to draw graphical displays of various types, some of the software features of calculator **10** include, software applications loading and storage, keystroke programming. It also permits data collection, display and analysis.

Various hardware features include a large pixel screen **11**, which is 100 x 160 pixels. A keypad **12** has various keys for data and command entry, some of which are used to implement the invention and are described herein. The calculator includes a processor **13** connected to a memory unit **14** a 256K byte RAM and 721K byte application spæce. Other features are an I/O port for data linking, and a unit-to-unit link cable connection capability.

As is typical of calculators, calculator **10** has a secondary function key, 2nd key **12a**, which permits other keys to have two functions. For example, by pressing 2nd key **12a** and then ESC/QUIT key **12b**, the calculator performs the QUIT function. For simplicity of explanation herein, a key having two functions is referred to in terms of the function appropriate for the context, i.e., when discussing the QUIT function, the ESC/QUIT key **12b** is referred to as the QUIT key **12b**. Similarly, calculator **10** has an Alpha key **12c**, which when depressed makes the other keys subsequently depressed to input an alpha character.

FIGURE **2** illustrates an example of the screen display of an embodiment of the present invention. This screen display is typical for the calculator illustrated in Figure **1** while running an application program called "Cellsheet." Cellsheet incorporates a spreadsheet program for a handheld device such as a graphing calculator according to the present invention. Cellsheet combines spreadsheet functionality with the power of a calculator.

The screen display **100** of Figure **2** shows the screen display after initiating the Cellsheet program. The top area of the screen display **100** shows a menu bar **102** with function tabs for each of the function keys F1 through F8. The main portion of the screen is the spreadsheet rows and columns **104**. In this embodiment, there are 64 columns labeled A through BL, where columns A through D are visible on the initial display. The rows are numbered, in this case 1-999, with rows 1 through 5 displayed initially. The upper left hand corner of the spreadsheet **106** identifies name of the current worksheet (XYZ).

On the bottom of the screen **100** is a status line **108**. The status line shows various calculator status items such as the open folder (MAIN) and display modes (RAD and AUTO). Above the status bar is the cell edit line **110**. The edit line shows the identification of the selected cell or cells and the contents of the cell. In Figure 2, the cell edit line shows the selected cell as cell A1, and the contents as empty. This line is also used to edit the contents of the cell.

The Cellsheet application program introduces an improved user interface to allow the user to calculate and enter results inside a spreadsheet cell without using or entering a formula. A particular problem with prior art computer spreadsheets is calculation in spreadsheet cells is done only with formulas. Further, in the prior art spreadsheet, the formula is always stored in the cell and displayed in the cell edit line when the cursor is over the cell. The present invention allows the user to easily make calculations within a cell and have the results stored in the cell rather than the formula used to calculate those results. It was discovered that in many cases the user may not want or need to store the formula or calculations. In the classroom situation, the teacher may want to hide the calculation or formula that produced the resulting cell entry. Other reasons to not store the formula or

calculation include reducing the calculation time to regenerate the spreadsheet display, and reduced memory needed for storing the spreadsheet. These advantages of the present invention were not found in the prior art spreadsheets.

In a preferred embodiment, an expression can be entered into the spreadsheet in three ways. The first is the prior art method, where an "=" or "+" sign proceeds the expression (e.g. =2+3). Figure **3a** illustrates entering a formula according to this prior art method. Figure **3b** shows the contents of the cell retains the formula, as shown on the cell edit line **110**, while the result is shown in cell A1.

In the second case, if the expression is not proceeded by a space, an "=" or "+" sign or other reserved characters, then the expression is evaluated, and the result is stored in the cell and not the expression. Figure **3c** illustrates entering an expression (2+3) on the cell edit line **110** according to this method. Figure **3d** shows the result of Figure 3c after pressing the enter key. The contents of the cell does not retain the formula or expression, as shown on the cell edit line **110**. Only the result of the expression or formula (5) is stored in the cell.

The third case is when the expression is proceeded by a space or quotation marks. In this case, the expression is stored in the cell in the form of text, and no result is calculated. Figure **3e** illustrates entering an expression (2+3) on the cell edit line **110** according to this method by preceding the expression with a space. Figure **3f** shows the result of Figure 3e after pressing the enter key. The text expression is stored in the cell, as shown on the cell edit line **110** and in the cell display. No result of the expression is calculated. In another example, a text expression can be entered by enclosing the expression with quotation marks. This method is shown in Figure **3g**.

Other Embodiments

Although the present invention has been described in detail, it should be understood that various changes, substitutions, and alterations could be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.

The described embodiment of the present invention is an application program on a graphing calculator, which allows the user to A particular problem with prior art computer

spreadsheets is calculation in spreadsheet cells is done only with formulas. The prior art formula is always displayed in the cell edit line when the cursor is over the cell. The present invention allows the user to easily make calculations within a cell and have the results stored in the cell rather than the formula used to calculate those results. Similarly, other embodiments include the same user interface functionality in a ROM software application package that is executed on a graphing calculator or other handheld device.